

one boundary and only one face, and that this property remains if the surface is "deformed" in the usual sense of that word. But it would be very troublesome to prove these facts analytically, and an ordinary person finds it hard to think of such a proof as being anything more than a superfluous *tour de force*.

Before leaving this chapter, attention may be directed to the use which is made of cuts (*coupures*) in the plane of reference. For certain purposes, as shown for instance by Hermite and Heine, it is more simple to use a plane with cuts in it than to construct a Riemann surface; and the beginner in function-theory may be recommended to master this method before proceeding to Riemann's.

The remaining chapters may be more briefly summarised. There is one on definite integrals introducing the indispensable notions of integrals by excess and defect, and functions of limited variation; one on development in series; two on complex variables and their functions; and one on the differentiation and integration of such functions. Very properly, the author has confined himself to well-known and comparatively simple functions as examples, and he has given figures to illustrate the conformal transformations effected by  $\zeta = e^z$ ,  $\zeta = \sin^{-1}z$ , and so on. As incidental examples, we may mention the Eulerian functions, and Weierstrass's factorial formula for a function the zeros of which are given.

Mathematical teachers will doubtless find this work of great value, because it helps to suggest what is really practicable in a course of lectures on this subject. The fact is that the theory of aggregates, and the classification of functions, have become such an essential part of all analysis that they cannot be ignored. A serious mathematical student must understand what is meant by such terms as closed and open aggregates, limiting points, uniform convergence, &c., and know something of the conditions for differentiation and integration. But if, with excess of zeal, the lecturer tries to bring out every point, and to be impeccably logical, he runs a serious risk of boring his audience.

G. B. M.

#### PHYSIOLOGY OF REPRODUCTION.

*The Physiology of Reproduction.* By Dr. F. H. A. Marshall. Preface by Prof. E. A. Schäfer, F.R.S., and contributions by Dr. W. Cramer and Dr. J. Lochhead. Pp. xviii+706. (London: Longmans, Green, and Co., 1910.) Price 21s. net.

THE progress of science is very haphazard. For centuries the problems of breeding and heredity have engaged the attention of intelligent men, but it is only within the last five decades that any accurate scientific knowledge on the subject of breeding has been reached. Even now almost all our knowledge of this subject has been derived chiefly from a study of the results of the mating of two germ-cells. This one-sidedness is due to the processes which take place during reproduction being so little known.

This unequal advancement of the sciences is seen again in physiology. Here the physiology of digestion, of muscular contraction, of the nervous system,

has been extensively studied, but that of reproduction has been largely neglected. Dr. Marshall has set himself to remedy this defect, and has collected all the available information on the subject. Reproduction incidentally concerns many different categories of people, and they have recorded their observations in numerous and varied periodicals and books. It must have been a task of considerable magnitude for the author to have collated all his sources of information; a glance at the references to quoted literature will convince us of this. The bibliography is in consequence not the least valuable part of the book.

But Dr. Marshall's volume is not merely a digested abstract of scattered papers taken from a great many journals; the author's own extensive work has given him an insight into his subject which enables him to impart information to his readers in a clear and lucid way. He has compiled a treatise which will remain a standard work for some time to come.

The work is to a great extent morphological, but, as everyone knows, it is absolutely necessary to have a sound knowledge of the structure of any organ before physiology is investigated. In studying such a process as the œstrus cycle, the exact morphological changes which take place in the uterus must first be known. This knowledge we owe to Heape, to whom we are glad to see the volume is dedicated, and it is the foundation of all our knowledge of the physiology of the œstrus cycle.

The author commences with a chapter on the breeding season of animals, examples being taken from invertebrates as well as vertebrates, but in subsequent chapters the higher mammalia are, with few exceptions, alone referred to. He then deals with the œstrus cycle and the changes which take place in both sexes both before and during reproduction. After this we have detailed all the evidence bearing on the changes in the maternal organs during pregnancy. The chapter on the biochemistry of the sexual organs seems only to show us how little we know, the information in it is so sparse and disconnected, and surely here is a valuable field for research. The last three chapters are on general questions of breeding, such problems as fertility and the determination of sex being dealt with.

Interspersed with the subject-matter we find the author's views on many theories as seen in the light of his own research. Thus, in the chapter on fertilisation, he gives a criticism of Mendelism. Close study of the actual physiology of reproduction does not lead the author to believe in the conception of unit characters, which the Mendelians have put forward. He speaks of the idea of attempting to locate latent characters of organisms in different parts of the germ-cell, as a survival from the times when all qualities, abstract or otherwise, were supposed to reside in different portions of the body. Whatever be the merits of this particular criticism, it seems that when further work has been done on the physiology of reproduction, a new mechanism may have to be supposed which will account for Mendelian facts, and fit in as well with the teachings of physiology.

Dr. Marshall has produced a masterly treatise

which gives us a very complete and critical review of all the facts of the physiology of reproduction. It will make a new "jumping-off place," as the Americans say, in research, and it is, moreover, admirably written. As an eminent gynaecologist said, "It is as interesting as a novel." It is a text-book which will be a great help to all those who are already working at the science, and a stimulus to encourage new workers. To everyone who is interested in breeding we would recommend this book, though it is not, however, in any sense a popular work.

#### SOUTH AFRICAN CRUSTACEA.

*Annals of the South African Museum.* Vol. vi., part iv., 6: *General Catalogue of South African Crustacea* (part v. of S.A. Crustacea, for the Marine Investigations in South Africa). By the Rev. T. R. R. Stebbing, F.R.S. Pp. 281-593, plates xv-xxii. (Cape Town: South African Museum; London: West, Newman, and Co., 1910.) Price 27s.

IN the study of the geographical distribution of marine animals, certain regions are of special significance from the fact that they lie on the border-lines between contrasted faunal areas, and offer, or may have offered in the past, possible routes of migration from one to the other. One of these critical regions is found at the Cape of Good Hope, where the faunas of the Atlantic, the Indo-Pacific, and the great southern oceans meet and, to some extent, overlap.

In recent years much information regarding the fauna of the Cape seas has been obtained in the course of investigations conducted under the superintendence of Dr. J. D. F. Gilchrist for the Cape Government, and published under the general title of "Marine Investigations in South Africa." To this series Mr. Stebbing has already contributed four important memoirs on the crustacea. In a fifth memoir, now published, he brings together the results of his own work and that of his predecessors who have dealt with this groups of animals, in a "General Catalogue of South African Crustacea," including the freshwater and terrestrial as well as the marine species.

In the present state of faunistic carcinology it is hardly possible to over-estimate the usefulness of such a catalogue, prepared, as it has been, with the thoroughness and detailed precision characteristic of all Mr. Stebbing's writings. Apart from the descriptions and figures of the numerous new and interesting species, the compilation of the bibliographical references alone must have involved a great amount of labour, of which subsequent students will reap the benefit. Although Mr. Stebbing touches only incidentally on geographical problems, his catalogue will provide a sure basis for future work on this subject.

As an example of the interesting points of detail contained in these memoirs, the case of the Cape lobster, *Homarus* (or, as Mr. Stebbing prefers to call it, *Astacus*) *capensis* may be mentioned. This pretty little species has been involved in obscurity since its first description in 1792 by Herbst, who stated that it

lived in mountain streams at the Cape. H. Milne-Edwards later gave a brief description of the species, but added no information as to its habitat. Huxley, referring to it, says:—

"I must confess myself to be in a state of hopeless perplexity respecting the crayfish or lobster which is said to occur at the Cape of Good Hope."

Mr. Stebbing now supplies a full description of the species from specimens sent to him by Dr. Gilchrist, and finally disposes of the story as to its freshwater habitat. Like the other two species of the genus, the European and American lobsters of the north Atlantic, it lives in the sea, and its remoteness from the areas occupied by its congeners offers a noteworthy example of "discontinuous distribution." It may be mentioned in passing that the only figure of the Cape lobster referred to by Mr. Stebbing is the original one of Herbst, which is very inaccurate. An excellent figure was given by H. Milne-Edwards ("Ann. Sci. Nat., Zool." (3), xvi., 1851, plate xi., Fig. 1); but as it occurs among the illustrations of a morphological paper, it is easily overlooked.

Mr. Stebbing's use of the generic name *Astacus* for the Cape lobster affords an instance of the difficulties into which "reforms" of nomenclature may lead the unwary student. In this case the detailed synonymy which Mr. Stebbing gives prevents any ambiguity, but, unfortunately, other writers are not so careful, and, in view of the long-standing error as to its freshwater habitat, it may not be superfluous to warn the student of geographical distribution that "*Astacus capensis*" is *not* a crayfish.

In many other points of nomenclature the catalogue challenges criticism. Mr. Stebbing is well known as an uncompromising advocate of the strict rule of priority, but he is by no means ready to surrender the right of private judgment, and is even capable of treating disrespectfully the decisions of the International Commission on Zoological Nomenclature. At all events, whatever may be the case with genera and species, there is no law to compel, nor any perceptible advantage to recommend, a renaming of the accepted orders and subclasses of crustacea; and there can be little doubt as to the opinion of zoologists in general on the proposals to substitute Thyrostraca for Cirripedia and Ostrapoda for Ostracoda.

W. T. C.

#### SCIENCE FOR THE GENERAL READER.

*Science in Modern Life.* Prepared under the Editorship of Prof. J. R. Ainsworth Davis. Vol. v. Pp. ix+207. (London: The Gresham Publishing Company, 1910.) Price 6s. net.

THIS volume comprises four contributions, namely, by Prof. James Wilson on agriculture (32 pp.), by Dr. John Beard on philosophical biology (32 pp.), by Prof. Benjamin Moore on physiology and medicine (90 pp.), and by Dr. H. Spencer Harrison on anthropology (52 pp.).

The first article is almost entirely historical; it contains an account of the chief advances in British agriculture from Saxon times, but has little to say on present-day problems and researches. More space